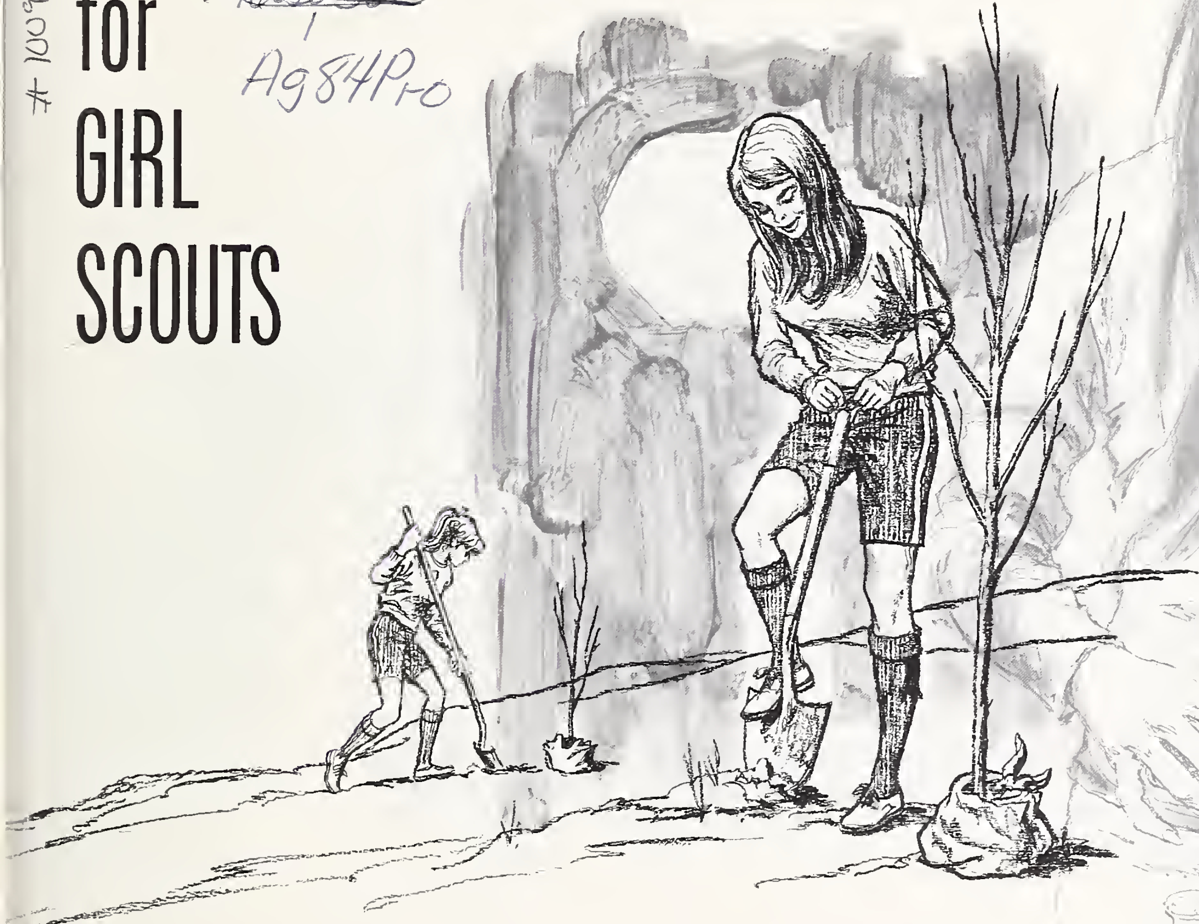
CONSERVATION ACTIVITIES for GIRL SCOUTS



U.S.Department of Agriculture • PA-1009 • Soil Conservation Service

PREFACE

Girl Scouts have worked for the conservation of natural resources for a long time—through nature studies, campsite improvement, and community projects.

Such projects as cleaning a stream and stabilizing streambanks or improving roadside planting often lead to a program for a quality environment throughout the entire community. Understanding the conservation practices necessary to the protection and management of a watershed can lead to broader insights into water resource problems and the need for long-range planning.

Each of the 21 activities described in this publication deals with conservation practices or resource observations and studies based on ecological principles that underlie all conservation projects. Most of the activities can be done by Girl Scouts of any age, although younger girls may need some help in applying the interpretations to the broad environmental problems of camp or community.

Understanding that the different kinds of soil have different capabilities and limitations will help Girl Scouts recognize the need for good land use practices in both rural and urban areas. Soil and water are basic natural resources. We live on the land, and we build on the land. All our food comes either directly or indirectly from the soil. Much of the information on soil and water relationships can be applied to on-going environmental projects on campsites and in home communities.

Conservation has been called ecology in action. Girl Scouts know the urgency of today's environmental problems, and are directing their council ecology programs and their conservation skills toward solving them.

For help in planning a conservation project, Girl Scouts can write, call, or visit local Soil Conservation Service (SCS) offices. They are listed in telephone directories under "United States Government, Department of Agriculture." Local soil and water or natural resource conservation district offices as well as state and federal conservation agencies and organizations also can give information about conserving natural resources.

21 ACTIVITIES

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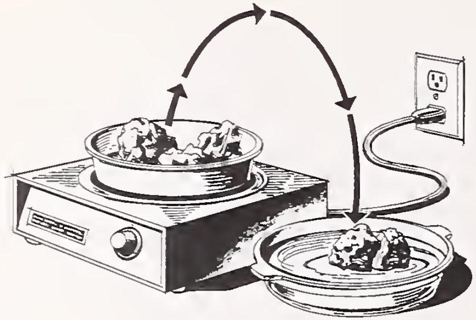
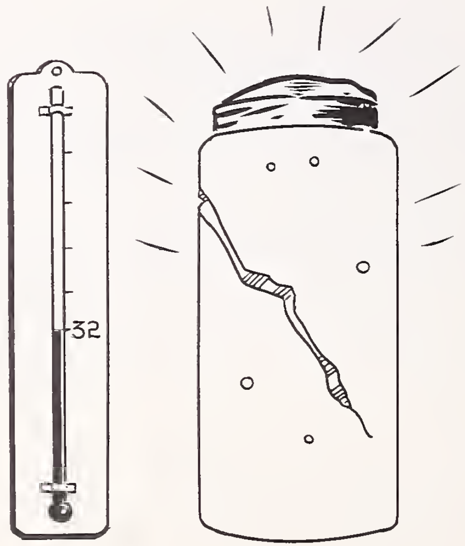
HOW IS SOIL FORMED?

Show how some of the forces of nature break down rocks into soil material by several simple demonstrations:

1. Rub two pieces of limestone or fine sandstone together. If you do not have natural stone, use pieces of building bricks or concrete. Notice how long it takes to rub off a few fine particles.

2. Heat a small piece of limestone over a flame or on a hot plate. Drop it quickly into a pan of ice water. What happens to the limestone as it contracts after its expansion by heating?





3. Fill a small glass jar with water, cap it tightly, and place it in a plastic bag. Let it freeze outdoors or in the freezing compartment of a refrigerator. Note what happens to the jar.

4. Put a few small pieces of limestone in a pan with some vinegar. Heat on a hot plate or over a burner and notice how bubbles form on the pieces of stone. These bubbles are carbon dioxide made from carbon and oxygen released from the limestone by a chemical change in the rock caused by the acid in the vinegar. If you continue this process long enough, the limestone will gradually break down.

INTERPRETATION

Soils form very slowly from parent rock that is broken down by "weathering." Weathering refers to the breaking up of rocks and minerals by forces of nature such as wind and water and by chemical changes.

When you rub two rocks together, small particles rub off. It takes a long time to accumulate even a spoonful. When glaciers moved over the land thousands of years ago, they ground rocks together, rubbing off tremendous quantities of rock particles of all sizes. Soils that formed from rocks carried by these glaciers cover much of north-central United States.

Changes in temperature also help to make soil. The sun warms the rocks during the day. At night the rocks cool. Expansion and contraction chip off particles of rock as you saw when you dropped the hot limestone into cold water.

Freezing water expands with tremendous force. Water that finds its way into cracks in the rocks freezes and breaks the rocks into smaller and smaller pieces.

Soils also are formed as rocks are rolled along by streams. Examine the smooth pebbles on beaches and along streams. They have been rubbed together until the rough parts are knocked off. These rubbed-off particles help form soil as they are deposited on a flood plain or at the bottom of a lake. Wind also blows small rock particles against larger ones, wearing both down.

As plants take root and grow, they help break down the parent material. When plants die and decompose, they add organic matter.

By putting the limestone in vinegar, you duplicate in a small way what happens in the soil as plant residues decompose. Carbon dioxide is one of the important end products in the decay of organic matter. Carbon dioxide dissolves in the soil moisture, forming weak carbonic acid. This acid reacts as the acetic acid in vinegar did with limestone and decomposes limestone and other rocks. The dissolving effect of this carbonated water is several times that of pure water. Since the lime in limestone is soluble, it gradually dissolves leaving only the other materials. It takes many feet of limestone to make a few inches of soil.

Rock particles do not become soil until living micro-organisms, air, moisture, and organic matter—decomposed plant and animal materials—are added. The many kinds of soil in the world are the result of different combinations of the five major factors of soil formation—time, topography, parent rock, climate, and living organisms including plants. Each kind of soil is made up of different quantities of minerals and organic materials that determine its physical and chemical properties that, in turn, determine how the soil will respond to different uses and treatment.

ND-56

The dark-colored upper part of the soil in which plants thrive is the product of centuries of weathering, accumulation of plant and animal remains, and the work of many living organisms. The lighter soil beneath is not as fertile; it does not contain much organic matter.

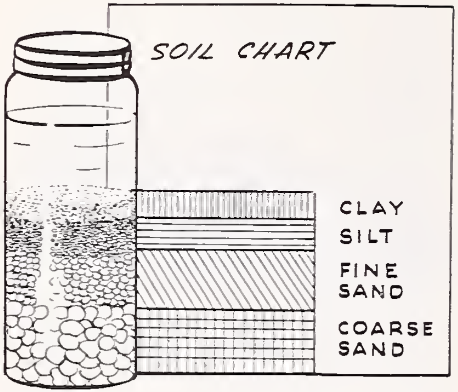
77,169

These hardy plants are slowly adding organic matter that helps form soil from weathered rock particles.

ARE ALL SOIL PARTICLES THE SAME SIZE?

Fill a jar about two-thirds full of water. Pour in soil until the water level is almost at the top of the jar. Replace the cover or put one hand tightly over the top of the jar and shake it vigorously. Then put the jar on the table and let the soil settle for about 24 hours.

Hold a card or heavy piece of paper against the side of the jar and draw a diagram showing the different layers. Label the layers—clay, silt, fine sand, and coarse sand. Do this with several soils taken from different places and compare the diagrams or the soils in the jars.



INTERPRETATION

Soil particles vary greatly in size. The largest particles settle to the bottom first. The fine particles settle slowly; some, in fact, are suspended indefinitely.

Soil scientists classify soil particles as sand, silt, and clay. Starting with the finest, clay particles are smaller than 0.002 millimeters in diameter. Some are so small that they cannot be seen with ordinary microscopes. Silt particles are from 0.002 to 0.05 millimeters in diameter. Sand ranges from 0.05 to 2.0 millimeters. Particles larger than 2.0 millimeters are called gravel or stones.

Soils contain a mixture of sand, silt, and clay in varying proportions. The percentage of each—sand, silt, and clay—determines the TEXTURE of a soil. A coarse-textured soil contains a greater proportion of sand, while a fine-textured soil is predominantly silt or clay. A medium-textured soil, commonly called loam, would likely have less than 50 percent sand and not more than 25 percent clay, with silt making up the remainder.

Except in very coarse soil, individual soil particles group together in clusters called "aggregates." The arrangement of soil particles into aggregates makes up the STRUCTURE of soil.

Together, texture and structure determine the amount of open spaces or pores in the soil; the number of pores, in turn, affects how much water will soak into the soil, how long water will be retained, and how readily water will move through the soil. Too much clay (the kind found in most U.S. soils) in proportion to silt and sand causes the soil to take in water slowly and also to give up water slowly to plant roots. Too much sand in proportion to silt and clay allows the water to move rapidly through the soil and out of the reach of plant roots.

Texture and structure of soils also affect the amount of air that enters soils and is used by plants and soil animals.

There are more than 70,000 kinds of soil in the United States. Each kind has its own combination of properties, including texture and structure, that makes it well suited for some uses and poorly suited for others. Soil scientists determine the capabilities and limitations of the different kinds of soil based on soil properties such as texture, structure, depth, slope, organic matter, and chemical composition of the soil; they describe, classify, and map soils. This soil survey information is used by planners, engineers, housing developers, farmers, and others who request it to help them make plans for communities, states, and regions.

Some kinds of soil, for example, can support the massive weight of buildings, shopping centers, airports, and highways; some are best for crops or range, wildlife habitat, and forests. Some soils are not suited to septic tanks, and others corrode underground pipelines and cables. By knowing the soils and their limitations as sites for industry, parks, recreation areas, sewage plants, sanitary landfills, homes, and highways, planners and developers can save taxpayers money—money now spent to clean sediment out of streams and harbors, to repair streets and highways that crack and fall apart, and to repair cracked foundations of homes and other buildings that are constructed on soils not suited to this kind of use.

HOW FAST DO SOILS TAKE IN WATER?

You will need six large tin cans; a board about 4 inches wide, 1 inch thick, and 12 inches long; hammer; 12-inch ruler; watch with second hand; pencil; paper; quart measure; and about 2 gallons of water.

Cut off one end of each can just below the rim, leaving a sharp edge that goes into the ground easily. Cut out the other end, leaving the rim for added strength.

Find spots close together with the same kind of soil in each of the following places; avoid sandy soils that do not hold moisture:

1. An ungrazed and unburned woodland where there is about an inch of leaves on the surface, or an undisturbed spot within a well-developed clump or row of shrubbery.
2. A heavily trampled area such as a path, trail, picnic grounds or playground, or a grazed woodland or pasture where livestock have packed the soil.
3. A fence row or park where the soil has never been plowed or a lawn with good grass cover that is not walked on much.
4. A construction site or cultivated field where topsoil has been removed or eroded away, leaving subsoil exposed.

Mark the outside of each can 2 inches from the end without the rim. In each spot set a can so that the end closest to the 2-inch mark is on the ground. Place a board on each can and tap with the hammer until the 2-inch mark is level with the ground. Do not disturb the plant material or soil in the can. Avoid spots where sticks or stones make it hard to drive the can down.

Add 1 pint of water to each can and for each location note place (identify as ungrazed woodland, heavily trampled path, etc.), condition of the soil (dry, wet, compacted, eroded, etc.), kind and amount of vegetation, time when water was added, and amount of water that has moved downward at the end of each minute for the first 10 minutes. Thereafter, note the water level every 10 minutes or every hour, depending on the rate of water movement. (Measure from the top of the can to the water level.) Compare the rates of water intake.

INTERPRETATION

The water intake or infiltration rate greatly affects the amount of water that runs off the surface carrying away soil particles. The more water that enters the soil, the less that runs off.

Generally, soils that take in water readily and retain moisture are best for plants. The water that soaks into the soil may continue its downward movement, and a part of it may go completely through the soil layers until it reaches the water table, which may be a few feet or several hundred feet below the surface. This underground storage supplies water for many cities and towns and in many places is pumped to the surface for irrigating crops.

How fast water soaks into a particular soil depends on many factors. In the demonstration, the texture and structure of the soil affected the infiltration rate at each location.

The amount of organic matter in the soil and the kind and amount of vegetative cover at each of the locations influences the infiltration rate also. Organic matter helps prevent compacting and keeps the soil pores open. Grasses and other ground-cover plants, mulches, and forest litter protect the surface pores by breaking the impact of raindrops, and the stems and blades help channel the water into the soil. Plant roots and the activities of living organisms in the soil also help to keep the soil open.

Still another factor that affects water intake rate is the amount of moisture already in the soil. Soils that have small pore spaces and are extremely dry do not absorb water quickly, and soils already filled with water cannot absorb more.

Because the soil is not uniform from the surface down to bedrock, the rate of water intake, as water passes from one layer to the next, can change. For example, a top layer can have a high infiltration rate, and the layer directly underneath a low rate.

DOES ORGANIC MATTER IMPROVE SOIL?

Fill two wide-mouthed glass jars with water, stopping about an inch from the top. Make two small baskets or wire racks from 3- by 10-inch pieces of $\frac{1}{4}$-inch hardware screen. Bend the screen so that it extends basketlike into the jars.

Collect one lump of soil that contains a large amount of organic matter from a site, such as a park or heavily wooded area, and another lump from a nearby unprotected area where most of the organic matter has been removed by erosion or excavation. Each lump should be about twice the size of an egg and as nearly the same kind of soil as possible. Place the lumps of soil in the baskets and lower them gently into the jars.

81,492

Left, soil from a cultivated field. Right, soil from an undisturbed fence row. Both samples were taken only 25 feet apart. The crumbly soil takes in water 20 times faster than the other.

Watch closely and make notes of what happens.

INTERPRETATION

Why does the soil from the unprotected area fall apart and drop to the bottom of the jar while the other one holds its shape and clings together? The answer lies in the difference in the amount of organic matter and the effect it has on both the physical and chemical properties of soils. Organic matter, as well as plant roots, allows water to enter the soil rapidly and helps the soil to hold water, thereby decreasing the amount of water that runs off the surface. Organic matter improves aeration, especially in the finer textured soils, makes the soil easier to work, and adds plant nutrients such as nitrogen needed by growing plants.

During heavy rains, the binding effect of organic matter and plant roots helps hold the soil particles and aggregates together so that they are not loosened and moved by water. When raindrops strike bare soil containing little organic matter, the soil aggregates break down easily, and the individual particles can then wash away.

DO DIFFERENT SOILS HOLD DIFFERENT AMOUNTS OF WATER?

You will need two cans of the same size, e.g., coffee cans; two 18-inch squares of cloth; heavy string; a scale that measures weights up to 64 ounces or 2,000 grams; and a container of water, such as a 2- or 3-gallon bucket or a 5-quart can with the top cut out.

Put equal amounts of soil in each can. Take one soil sample from an eroded field or garden that has been cultivated for many years and has little organic matter. This sample should be hard and cloddy. Take the other sample from a nearby undisturbed grassed or wooded area. This sample should contain organic matter and be crumbly and free from clods.

Allow the soils to dry for several days. Then empty the two soil samples on the cloth squares, pull the corners together, and tie with a heavy string. Weigh each sample and record its weight. Is there a difference in weight?

Hold each bag of soil in the water for about 10 minutes. Remove the samples from the water and drain. Then weigh again and record the weights. Is there a difference in weight between the wet samples? Between the dry and wet weights of each sample? Which sample holds more water?

INTERPRETATION

A medium- to fine-textured soil with little organic matter packs together and has few air spaces or pores; its particles do not cling together in aggregates; and when dry it weighs more than an equal volume of dry soil high in organic matter.

A soil containing organic matter not only takes in water faster but also holds more. Humus—the decomposed organic matter that enriches soil—can absorb much water. On a dry-weight basis, humus has a water-holding capacity of several hundred percent of the dry weight and acts like a sponge. This capacity to absorb water also means less erosion and less sediment in streams.

When the soil is frozen or is saturated by prolonged or heavy rains, any additional water then runs off. But until the soil is saturated, it stores up water for plants to use and lets it seep into the soil substrata, eventually reaching streams and underground reservoirs.

Growing plants need lots of water. To produce a pound of potatoes takes 80 gallons. One oak tree uses 50 gallons of water a day.

Hardwood forests must have ample rainfall. Leaves and twigs on the forest floor serve as mulch to reduce evaporation.

W.VA.-720

WHAT KIND OF LIFE IS IN THE SOIL?

Use a ruler, a small spade, six or more small bottles with lids or corks, and a small magnifying glass or hand lens for this activity, which is best done in spring. In a 1-foot square, digging 2 or 3 inches deep, collect soil from the following places: (1) A wooded area; (2) an undisturbed grassy area or weed patch in a vacant lot; and (3) an eroded area or excavation site with exposed subsoil.

As you remove the soil, look for burrows of worms and other animals and for the eggs of insects. Put each sample on a large sheet of white paper.

Carefully sort each soil sample, watching closely for living things. One-foot squares of 1/4-inch hardware screen help in sifting the samples. Place the different kinds of animal life in separate bottles. Count the animal life belonging to such groups as:

- Worms.
- Grubs and larvae.
- Snails and slugs.
- Insects—3 pairs of legs.
- Spiders, mites, ticks, or other animals —4 pairs of legs.
- Animals with more than 4 pairs of legs.

Which soil sample has the most animal life? How is the amount of animal life related to the rate these soils absorbed water in the activity on page 7? Do the amounts of animal life and burrows made by the animals appear to improve soil structure?

Estimate the total number of animals per acre (43,560 square feet in an acre) for each group from each of the sampled areas. Also estimate the grand total of all the animals for 1 acre for each sample. No matter how large the total number of visible animals, it is small compared to the number of microscopic plants and animals, particularly bacteria and fungi, present.

INTERPRETATION

The soil is the home of innumerable kinds of plantlife and animal life, most of which are too small to be seen without a powerful microscope.

Living organisms have a marked effect on soil. Because of their burrowing habits, for example, a lot of soil mixing takes place. They improve soil aeration and drainage. Small animals and plantlife in the soil do most of the work of converting the nutrients in undecayed organic matter to the inorganic forms that growing plants use.

At the same time, the structure and texture of the soil, how well air moves through it, how wet or dry it is, how much organic matter it contains, whether it is alkaline or acid, and how the soil is used, all affect the number of organisms in the soil.

Plantlife too small to be seen without a microscope includes bacteria, fungi, and algae. A gram of soil may contain from 1 to 4 billion bacteria, 8,000 to 1 million fungi, and as many as 100,000 soil algae.

Animals that spend all or part of their lives in the soil include protozoa and nematodes that are too small to be seen without a microscope, earthworms, some rodents, ants, snails, spiders, mites, and various other worms and insects.

Earthworms are an important group of larger soil animals. They live in soils that are high in organic matter and not too sandy or clayey. Their number may range from a few hundred to more than a million per acre. As soil passes through their bodies, mineral particles and organic matter are converted into nutrients that can be used by plants. Burrows left by earthworms let water and air move more freely through the soil. Earthworms also bring soil from lower levels to the surface, thus mixing the soil.

HOW DOES WATER MOVE THROUGH SOIL?

You will need three glass cylinders or plastic containers open at both ends, three small pans or low wide-mouthed glass jars, thin cloth, and string or rubber bands.

Fasten the cloth over the tops of the cylinders. Turn them upside down and insert them in holders so they remain vertical. Fill the cylinders three-fourths full with one of the following dry soils:

1. Sand.
2. Dark, crumbly loamy soil like that under good grass sod or topsoil from a garden or commercial nursery.
3. Clay. This kind of soil is sticky when wet and dries in hard clods. Grind up the clods and put the dry clay in the cylinder.

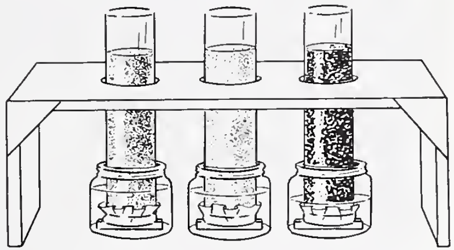
Tap the cylinders lightly on a table to settle the soil. Set the cylinders in the jars and pour water in the jars.

Compare the movement of water in the three cylinders. Record how long it takes the water to move 1, 2, and 3 inches in each cylinder. Note if the water reaches the top and, if so, how long it takes.

INTERPRETATION

Moisture moves through soil in all directions, even against gravity, by capillary action. The attraction water molecules have for each other as well as the attraction between water molecules and soil particles causes this movement. When a drop of water falls on soil particles, it spreads out as a thin film over the soil particles—because the attraction between the soil particles and the water molecules is greater than the attraction between the water molecules themselves.

How far and how fast capillary water moves in a soil depends on the texture and structure of the soil and on other soil conditions. If the spaces around the soil particles are large, as in coarse-textured or sandy soils, the attraction between the water molecules and the soil particles is not enough to overcome the weight of the water. The water does not rise much; however, what movement it makes is rapid because there is little friction.



On the other hand, in fine-textured clay soils the particles are closer together and the attraction between soil and water is greater. Water may then be expected to rise more slowly in such soils.

Much soil moisture is lost when water moves to the surface by capillary action and evaporates.

The rate and amount of water movement in a soil help determine the amount of water available to plants and how well septic tanks will function.

GA-1,045

This school's septic tank has overflowed after a heavy rain. It can happen when soil limitations are not considered in planning and construction.

DO DIFFERENT SOILS AFFECT PLANT GROWTH?

Fill four flowerpots, each with one of the following kinds of soil: (1) Topsoil from an undisturbed grassed area or woodland; (2) topsoil from the same kind of location but in a nearby flood plain; (3) soil from an eroded hillside or excavation site; (4) subsoil, which can be taken from a roadbank where the different layers of soil can be readily distinguished.

Plant three or four dried beans in each flowerpot. (Soaking the beans overnight in water hastens germination.) Keep the flowerpots watered and place them where it is warm and sunny. At the same time plant three or four beans in cotton and keep them moist. Compare the rates of growth of the plants in the four different soils for several days. Record how fast the beans in each flowerpot grow and how each plant looks. What are the differences between the plants grown in the various soils and those grown in cotton?

INTERPRETATION

Plants take almost all their mineral nutrients from the soil. Plants vary, however, in the combination of minerals they can use. Soils also vary in mineral composition and in amounts of plant nutrients.

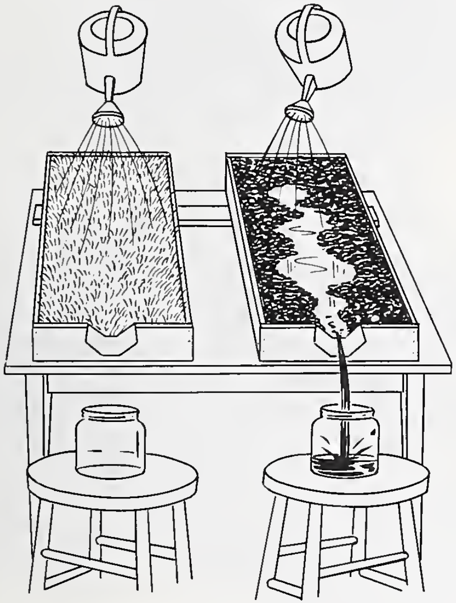
In general, soils that contain a large amount of organic material are more productive than soils low in organic matter. Organic matter increases the water-holding capacity; it serves as a storehouse for plant nutrients such as nitrogen, and it provides food for countless bacteria and other living things in the soil. Some of these organisms produce acids that in turn help break down soil minerals. Plants, therefore, usually grow better in topsoil than in subsoil because of larger amounts of organic matter in topsoil. Soils found in flood plains are usually more fertile than the soils found in adjacent high-lying areas, because minerals and nutrients have been eroded away from the surrounding upland soils and deposited in the low-lying flood plains.

UT-1,541

The soil was not suitable for agriculture, but it was good for building homes.

DOES PLANT COVER AFFECT SOIL LOSS?

You will need two small boxes about 16 inches long, 12 inches wide, and 4 inches deep; plastic, foil, or tin; two flower sprinklers, quart-size or larger; 2 half-gallon wide-mouthed jars; and two sticks of wood about 1 inch thick.



Line the boxes with plastic, foil, or tin to make them watertight. (These boxes can be used for several activities so they are worth keeping.) At one end of each box cut a V-notch 1 to 1½ inches deep and fit with a tin spout to draw runoff into the containers.

Cut a piece of sod from a lawn or well-grassed area to fit one box. Trim the grass with scissors so that it is not more than an inch high to make it easier to handle. Fill the other box with bare soil from the same place—no grass, just soil. Set the boxes on a table so that the spouts extend over the edge. Place the sticks under the other end to form a slope. Put the empty jars on stools placed beneath the spouts.

Fill the two sprinklers with water; pour the water steadily on both boxes at the same time and at the same rate. Hold the sprinklers about a foot above the boxes. What happens to the soil in each box?

INTERPRETATION

The water that rushes off the bare soil takes soil particles with it. After the flow stops, the jar contains muddy water.

The water that flows from the grass is reasonably clear. It takes longer for the flow to start, and it continues longer. Also, not as much water runs into the jar.

This activity illustrates one of the most fundamental principles of soil and water conservation—the protection plants give soil against the pounding of raindrops and the movement of running water.

Plants break the force of raindrops so that the soil is not disturbed by the impact. The plant roots open up channels to let water into the soil. Organic matter furnished by decayed plants also lets water enter more readily. Vegetation slows the flow of runoff so that it does not pick up enough speed to disturb the soil and cause erosion.

Some plants such as grasses protect the soil better than others. Cultivated row crops such as corn, potatoes, and tomatoes, and widely spaced seedlings and small trees leave much of the soil surface exposed to rain and running water.

Plants of many kinds can be used to help hold the soil in place in backyards, on vacant lots, farms, construction sites, roadbanks, campsites, and along trails. Plant cover reduces the amount of runoff that carries soil particles to rivers, lakes, and reservoirs.

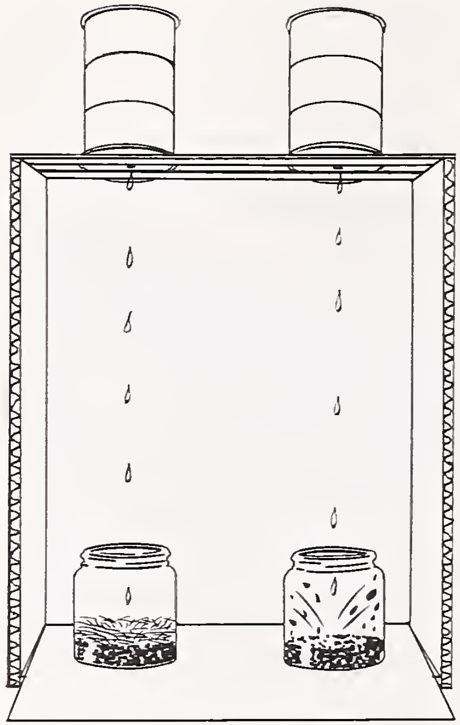
MICH-61,017

Grasses and other kinds of vegetation such as this periwinkle prevent erosion on steep banks.

DOES MULCH PREVENT SOIL LOSS?

Use the same boxes you made for the previous activity. Fill them both with bare soil. Set them on the table as before, placing the sticks under one end to make a slope. Cover one box of soil with a thin layer of straw, grass clippings, wood shavings, compost, or sawdust; leave the other one bare. Sprinkle water on both boxes, using the same amount of water and pouring at the same rate from an equal height. Note how much and how fast water runs into each jar.

Another way to study how mulches protect the soil: with a nail, punch a hole in the bottom of two small tin cans and fill the holes loosely with cotton. Put one-half inch of soil in two large jars or glasses. Put a light layer of dry grass clippings on one of the soil samples and leave the other one bare. Arrange the tin cans so that they are about 4 feet above the jars. Put about one-half inch of water in the cans. Watch the large drops of water form through the holes in the cans and drop on the soil in the jars. Note the amount of soil that is splashed on the sides of the glass.



INTERPRETATION

When the soils on new construction sites, trails, campsites, cultivated fields, and embankments along roads and highways are left unprotected, erosion occurs. Mulches prevent erosion where vegetation is scanty or where heavy foot traffic prevents the growth of grasses and other types of ground cover. Mulches are also used on newly seeded areas, particularly on steep slopes and banks, to hold the seed and fertilizer in place and to reduce the loss of soil moisture by evaporation.

On steeply sloping soils in both urban and rural areas, mulches must be anchored to keep them from blowing or washing away. Anchoring methods include spraying the mulch with a thin layer of asphalt, stapling netting over the mulch, or driving pegs into the mulched area at intervals of about 4 feet and interlacing them with twine.

CAL-7450

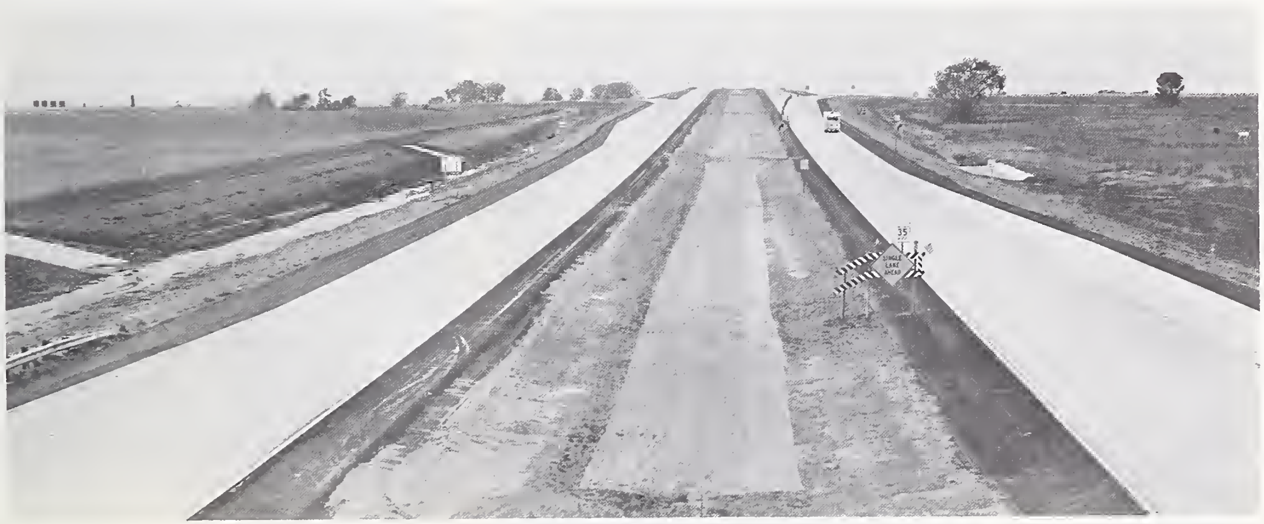
Girl scouts plant and mulch the slope of a small dam to help keep the soil from washing into the reservoir and polluting the water.

WO-17-11

Wood chips, between steps on a steep slope and on trails where natural vegetation cannot survive heavy use, protect the soil and prevent erosion caused by surface water runoff.

KAN-2,021

New grass seeding to control erosion during highway construction is protected by jute netting and by mulch.



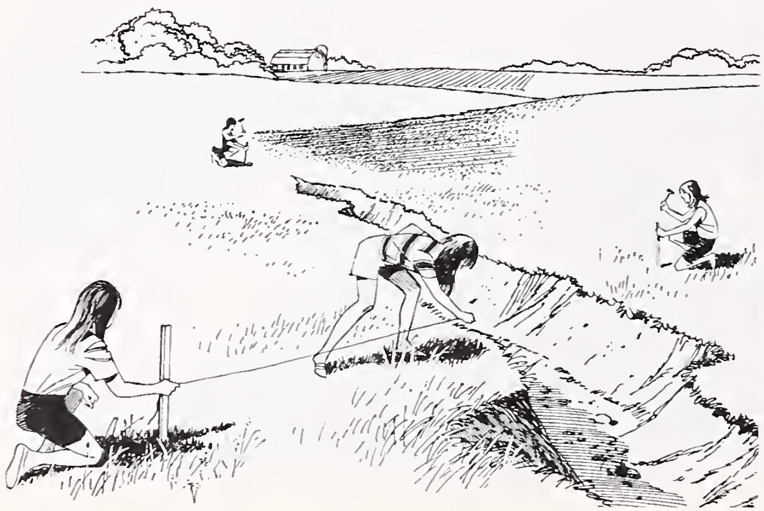
Measure the growth of a gully along a road or trail, on a campsite, or in a field. Drive wooden pegs 10 to 15 feet above the gully head and on each side of the gully. Measure the width, depth, and length of the gully. After a rain, measure from each stake to the nearest edge of the gully to see how much the gully has grown. Do this after several rains and compare your measurements to see how much the gully has grown since you first set the stakes. Measure the width, depth, and length of the gully again and figure out how many cubic feet of soil have been lost.

INTERPRETATION

Soil washed from an area is not necessarily lost forever. But for all practical purposes it is lost for a long time. The soil that fills the bottom of a lake, for example, is still soil, but it is useless for growing crops.

The first person to suffer from loss of soil usually is the farmer. Many experiments have shown that, in general, the deeper the topsoil the higher the yield of crops. In Missouri topsoil 12 inches thick produced 64 bushels of corn per acre while topsoil 4 inches deep produced 38 bushels. The soils were side by side and received the same treatment. In Washington, wheat yielded 35 bushels per acre on topsoil 11 inches deep, but only 23 bushels on topsoil 5 inches deep. So the farmer loses when he loses topsoil. His crop yields go down. The cost of producing each bushel of grain or pound of meat goes up. And he makes less money or even loses money.

People everywhere depend on the farmer to grow their food. The surplus that he grows becomes their three meals a day. Actually, whole civilizations depend on this surplus. The primary producers—the farmers—must supply a surplus of food and



CAN THE AMOUNT

Conservation practices used during constru

Measure the growth of a gully along a road or trail, on a campsite, or in a field. Drive wooden pegs 10 to 15 feet above the gully head and on each side of the gully. Measure the width, depth, and length of the gully. After a rain, measure from each stake to the nearest edge of the gully to see how much the gully has grown. Do this after several rains and compare your measurements to see how much the gully has grown since you first set the stakes. Measure the width, depth, and length of the gully again and figure out how many cubic feet of soil have been lost.

INTERPRETATION

Soil washed from an area is not necessarily lost forever. But for all practical purposes it is lost for a long time. The soil that fills the bottom of a lake, for example, is still soil, but it is useless for growing crops.

The first person to suffer from loss of soil usually is the farmer. Many experiments have shown that, in general, the deeper the topsoil the higher the yield of crops. In Missouri topsoil 12 inches thick produced 64 bushels of corn per acre while topsoil 4 inches deep produced 38 bushels. The soils were side by side and received the same treatment. In Washington, wheat yielded 35 bushels per acre on topsoil 11 inches deep, but only 23 bushels on topsoil 5 inches deep. So the farmer loses when he loses topsoil. His crop yields go down. The cost of producing each bushel of grain or pound of meat goes up. And he makes less money or even loses money.

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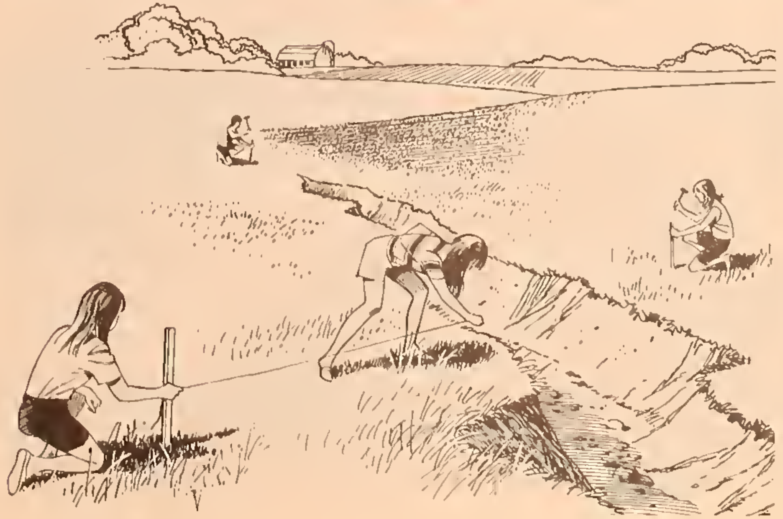


CAN THE AMOUNT OF SOIL LOSS BE MEASURED?

MD-30,521

Conservation practices used during construction could have reduced runoff and sedimentation.

fiber before the artisans, engineers, scientists, philosophers, writers, and others can live.

How badly has erosion hurt America? Millions of acres once cultivated have been lost to food production because of erosion damage. And according to latest surveys, erosion is still the dominant problem on 706 million acres of rural private land. Of 437 million acres used for crops, 401 million acres have a major conservation problem. Erosion is the principal limitation on 221 million acres or 55 percent of this cropland.

Every year more than a million acres are taken out of farming and put into highways, housing and other urban developments, and airports. During construction of these projects, most of the topsoil and vegetation is stripped away, leaving large tracts of land highly vulnerable to erosion. The number of such areas with accelerated erosion is increasing, and these areas are rapidly becoming major sources of sediment. As acre after acre of soil is covered with concrete, blacktop, and buildings, less and less precipitation soaks into the soil. The resulting increase in runoff causes flooding and adds to erosion and sedimentation that, in turn, pollutes water, and fills harbors and reservoirs with silt.

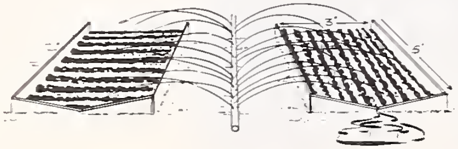
TEX-51,239

Unprotected soil near this apartment building washed away during heavy rains. The concrete waterway (right) has been damaged and the service pipes (left) are exposed.

WHAT DOES CONTOURING DO?

Fill both boxes used in previous activities (pp. 13 and 14) with bare soil taken from the same place. Set them on a table and place sticks under the ends to make a slope. Place jars below the spouts of the boxes as before. Using your finger or a pencil, make furrows across the slope in one box and up and down the slope in the other. Fill two sprinklers with water and slowly sprinkle the two boxes at the same time. Hold the sprinklers the same height above the soil and pour at the same rate. Compare the rates of flow into the jars and note the difference in sediment.

Or put mounds of soil in the middle of the boxes or in two large, round pans. With a pencil or your finger make furrows up and down one of the mounds and circles around the other. Sprinkle the same amount of water on each mound and observe the runoff.



You can also use a larger area outdoors to show the effect of contouring. If you have a sloping area in a yard or campsite where there is no grass or where the grass is badly worn by walking or playing, mark two plots 3 feet wide and 5 feet long with 1 or 2 feet between them. With a regular garden hoe or stick cut grooves 4 inches apart and about 2 inches deep across the slope on one plot and up and down the slope on the other. Lay a perforated lawn-sprinkling hose between the two plots so that a steady shower falls with equal intensity on both plots. Note carefully what happens on both plots.

WO-43-25

Trails built on the contour, at right angles to the slope, not only help reduce erosion but also make walking easier.

INTERPRETATION

Furrows and ridges built across the slope catch and hold water where it falls so that it has time to soak into the soil. Furrows running up and down slopes, on the other hand, are like small ditches that allow the water to flow off rapidly carrying soil particles with it. On large tracts of land, furrows and ridges, constructed at right angles to the direction of the slope, follow contour lines so that the furrows themselves are on the level across the slope.

Following these lines whenever possible in any kind of land use, such as building trails and highways, planning housing developments and construction projects, or planting gardens and crops, helps reduce erosion by slowing runoff.

Contour farming is a widely used conservation practice. You can see the curved lines of plantings and roads built on the contour as you fly across the country.

DOES SLOPE AFFECT RUNOFF?

Measure the steepness of a slope using the following materials—a yardstick, a straight stick exactly 50 inches long, and a carpenter's level or a flat bottle half full of colored water. If you use the bottle, lay it on its side on a level surface. With a pencil or piece of tape, mark a straight line along its side following the top of the water level.

Find a location on a campsite, in a backyard, along a roadbank or trail, or any place where you want to know how steep the slope is.

Place the 50-inch stick horizontally on the ground (one end will be higher than the other because of the slope). Put the level or the bottle on the 50-inch stick, and move the lower end of the stick up or down until the bubble or the water shows that the stick is level.

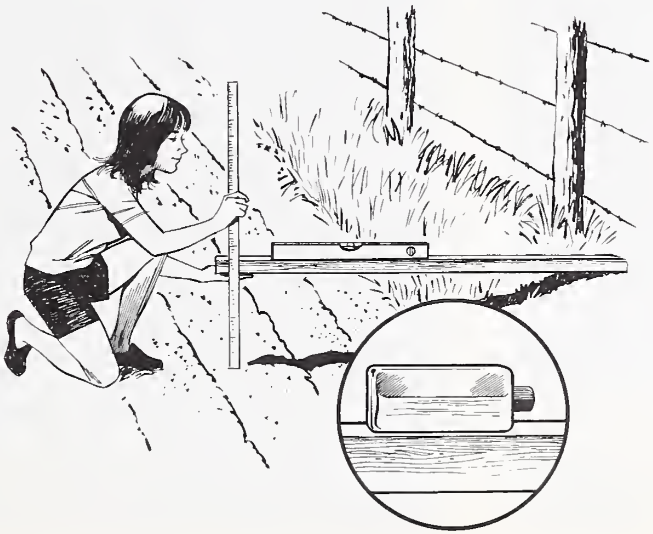
With the yardstick measure the distance from the ground to the bottom edge of the horizontal stick. This reading in inches, multiplied by 2, gives the percentage of slope. If you use a stick 100 inches long, the reading on the yardstick gives the percentage of slope and you do not need to multiply by 2.

INTERPRETATION

Slope is important in deciding proper land use. It often determines whether a piece of land should be used for grass, trees, or cultivated crops. It also must be considered when selecting sites for houses, trails, campsites, buildings, highways, septic tanks, sanitary landfills, and parks.

Length and steepness of slope, together with the type of soil and the kind and amount of vegetation, affect the speed of runoff and the amount of erosion. As the slope gets steeper, particularly on unprotected fine-textured soils, the water flows faster and carries more soil with it. The longer the slope, the more chance runoff has to pick up speed and move increasing amounts of soil.

On both urban and rural land, various conservation practices help slow the movement of water down slopes, thus allowing more time for the water to soak into the soil. Some of these practices are mulching and planting grasses on roadbanks, construction sites, and campsites; laying out trails and planting crops on the contour; and constructing terraces and diversions.



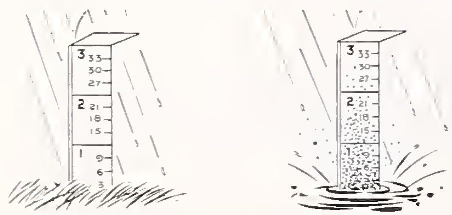
WHAT IS SPLASH EROSION?

You will need two boards 1 inch thick. 4 inches wide, and 3½ feet long. Sharpen one end of each board. Paint the boards white. Beginning at the sharpened end, mark lines across the boards at 1-foot intervals. Attach a tin shield about 4 inches wide and 8 to 10 inches long to the top of each board to help prevent rain from washing off the splashed soil.

Locate two spots with different amounts of grass cover such as:

1. A bare or nearly bare spot where the grass is well trampled and an untrampled spot where the grass is heavy.
2. A field or garden planted in a cultivated crop such as corn or other vegetables and a meadow or lawn where grass is growing.

Drive the sharpened boards 6 inches into each spot of ground. Observe the boards after the first rain. Or fill a sprinkling can and, holding it 3 to 5 feet above the two spots, sprinkle the same amount of water about 1 foot from each stake. After the rain or after using the sprinklers, note the difference in the amount and height of soil splashed on each board.



INTERPRETATION

You can observe the effects of splash erosion after any hard rain—splashed soil on vegetables and flowers, foundations of buildings, basement windows, and picket fences. One reason for mulching strawberries is to keep splash off the fruit.

Soil Conservation Service studies show that from 1 to 100 tons of soil per acre may be splashed into the air during one rain. This splashed-up soil consists of single particles dislodged from the soil mass. Once dislodged, they are easily transported from their original location by any water movement on the surface, no matter how slight. There need not be a steep slope for this kind of erosion since fine particles can be carried by slow-moving water. Soil particles may be splashed to a height of more than 2 feet and moved more than 5 feet horizontally on level surfaces. On steep slopes soil particles fall downhill, and considerable soil is moved without being carried by water.

Any kind of plant cover protects the land from the impact of raindrops, but the extent of such protection depends on the size and growth characteristics of the plants. Grasses and other vegetation that cover the ground are most effective in preventing splash erosion. Mulches and residues help protect the bare soil around a tree and between newly planted crop rows or on construction sites.

VA-5,542

Small stones are left on pedestals of soil after heavy rain has carried away the surrounding soil particles.

74,887E

A raindrop splash on bare soil can dislodge soil particles so that they are moved easily by runoff.

21,399

A dense stand of wheat, grass, or other close-growing vegetation breaks the force of raindrops, allowing them to fall gently to the ground.

HOW MUCH SEDIMENT DOES A STREAM CARRY?

You will need three tall, narrow bottles such as olive bottles with tight stoppers or lids. After a heavy rain, fill one of the bottles from a small stream, a roadside ditch, or street gutter, where most of the runoff comes from areas of unprotected soil such as cultivated fields, newly excavated construction sites, eroded lawns, vacant lots, or roadbanks. Find a second location where most of the runoff comes from wooded areas, and a third site where the water comes from grassed land. Fill the other two bottles with water from these sites.

Allow the samples to settle for 24 hours. Measure the amount of sediment found in each bottle.

MD-30,500

The runoff from this housing development pollutes the nearby stream.

INTERPRETATION

An important story is in these bottles —the story of how soil erosion on unprotected land in both rural and urban areas produces sediment that affects both the farmer and city dweller in many ways.

Sediment fills roadside ditches, plugs culverts; it clogs stream channels so they must be cleared by dredging. All this increases taxes. Many harbors must be dredged annually at taxpayers' expense.

Floods in some places are more frequent and serious because the streams are choked with sediment and have less capacity to carry floodwaters. Sediment also harms fish by covering their spawning grounds and shading out light. Many fish die during floods when their gills are clogged with sediment.

Water-supply reservoirs lose storage capacity each year to sediment. Water bills are higher because the water must be filtered. Some of the electric power generated in the United States comes from hydroelectric plants; the storage reservoirs serving these plants are gradually filling with sediment.

Much of the sediment in a stream results from improper use of the land in its watershed. By understanding the capabilities and limitations of each kind of soil within a watershed, local communities can plan and zone areas for developments so that they can make the best use of each soil for houses, schools, septic tanks, highways, open spaces, parks, forests, or for farming.

DO BIRDS HELP TO DESTROY INSECTS?

Locate the nest of an insect-eating bird. After the eggs have hatched, watch the nest for an hour at the same time each day and count the number of trips the parent birds make to the nest. Do this for several days and average the number of trips they make in an hour. On each trip the birds are carrying at least one insect of some kind. After you have made the count for several days and have averaged the number of trips per hour, multiply this figure by the number of daylight hours for an estimate of the total number of insects one family of birds consumes in a day.

INTERPRETATION

Most forms of wildlife help gardeners, farmers, and ranchers produce more and better crops by destroying insects, weeds, rodents, and other pests.

Birds are especially valuable because of their food habits. Having higher body temperatures, more rapid digestion, and greater energy than most other animals, they require more food. Nestling birds grow rapidly and usually consume as much as or more than their own weight in soft-bodied insects every day.

One young robin weighing 3 ounces consumed 165 cutworms weighing $5\frac{1}{2}$ ounces in 1 day. If a 10-pound baby ate at the same rate, he would eat $18\frac{1}{3}$ pounds of food in a day.

Soil and water conservation practices in both city and country help increase the number of birds and other forms of wildlife.

Trees and shrubs used for windbreaks, hedges, screens, and landscaping around campsites, backyards, and fields provide food, cover, and travel lanes for many kinds of wildlife. Plants used for shade and erosion control around houses, office buildings, schools, and on campsites also can be selected to attract wildlife.

Fish, birds (particularly waterfowl), and small mammals benefit from man-made ponds surrounded with grasses, legumes, shrubs, and trees. Improved rangeland in the open spaces of the West provides grass and woody plants for antelope, deer, and elk as well as beef cattle.

ND-741

Some birds such as owls and hawks are enemies of mice, rats, gophers, and other destructive rodents.

MINN-990

Robins can gain eight times their original weight during the first 8 days of life.

DOES FERTILIZER AFFECT PLANT GROWTH?

MO-2038

Missouri Highway Department employees spray fertilizer and seed on a freshly prepared seedbed. A thin layer of straw mulch protects the area until the vegetation becomes established.

You will need two quart-size flowerpots; soil of low fertility; seeds of tomatoes, beans, corn, or wheat; clean sand; and nitrogen and phosphorus commercial fertilizers.

Get the soil from an eroded roadbank or exacavation site or from an eroded field that has been farmed heavily. Or dig into the soil a foot or more and get subsoil. For the nitrogen fertilizer use ammonium nitrate or ammonium sulfate. And for the phosphorus fertilizer use superphosphate. Place about 1 pint of soil on a sheet of paper. Add to this soil about half a teaspoon of nitrogen fertilizer and the same amount of phosphorus fertilizer. Mix these fertilizers thoroughly with the soil. If the pots hold a quart, then put a pint of the original soil in one pot and finish filling it with the fertilized soil. Fill the other pot with unfertilized soil.

Plant a few of the same kind of seeds in each pot and cover with about one-fourth inch of sand to prevent soil crusting. When the plants are well established, thin them to the same number in each pot. Watch their growth for several weeks.

INTERPRETATION

Soil fertility is a major factor in soil conservation and in the growing of food. By adding fertilizer and lime when needed to keep soils highly productive, we not only help conserve the soils but also aid conservation in general in the following ways:

1. High soil fertility produces a heavier plant growth that protects soil from washing and blowing.
2. Heavy plant growth resulting from high fertility uses more water than the growth on poor soil. Therefore the soil has room for more water from each rain, reducing runoff.
3. Higher soil fertility increases crop yields on the more level fields, reducing the need for growing row crops on sloping fields where erosion is heaviest. Sloping fields that erode easily can be kept in grass and trees. By improving the fertility of soils, fewer acres are needed for crops, thus releasing more land for livestock, grazing, forestry, wildlife, and recreation.

Since few soils contain the right balance of all the elements for optimum growth for any one plant, some kind of fertilizer is usually needed. A soil may be high in nitrogen and potassium but low in phosphorus. Nitrogen stimulates the growth of leaves and stems and gives plants a dark green color; phosphorus helps develop plant seeds as well as other parts of the plant; and potassium is needed to grow strong stems.

Nitrogen, phosphorus, and potassium are so commonly used in commercial fertilizers that their percentage is always noted on the fertilizer bag in the same order. For example, a 5-10-5 fertilizer contains 5 percent total nitrogen, 10 percent phosphoric oxide, and 5 percent potash.

Soils can be tested to determine what elements they need. The four most commonly needed elements are calcium, nitrogen, phosphorus, and potassium. If there is enough rainfall and other conditions are favorable, better plant growth can be expected with the addition of needed fertilizers.

CAN YOU TRACE THE ORIGIN OF THINGS USED DAILY?

A pencil and paper are all you need for this activity. List items that you use every day. Write where the items came from and the steps along the way. (As a group activity, two groups using blackboards and chalk can compete with each other to see which can be first to trace the origin of an item.) For example:

Shoes—department store—shoe factory—tannery (where leather is made from cattle hides)—packing plant (where animals are slaughtered)—stockyard (where farmers and ranchers sell their animals)—farm or ranch (where cattle are produced)—corn, oats, hay, and other feeds that cattle eat (grown on the farm)—*soil* in which these crops are grown.

Candy bar—store or vending machine—candy factory—

Now break down into various ingredients: chocolate—chocolate bean—plantation in Brazil—cocoa tree—*soil.* Sugar—sugar factory—plantation in Hawaii—sugarcane field—sugarcane—*soil.* Nuts—peanut distributor—field in Georgia—peanut plant—*soil.*

Try others such as articles of clothing (nylon and wool) and an eraser (synthetic rubber). You may want to use an encyclopedia.

INTERPRETATION

Soil is one of our basic natural resources. From it we get food, clothes, and building materials.

Gardens and truck farms supply vegetables; fruit comes from orchards, groves, and vineyards. Wheat and corn for making flour and meal for bread come from planted field crops. Nuts and berries come from forests and farms.

Animal food comes from the soil too. Cows eat grass, hay, silage, and grain to produce milk. Hens eat grain and other feeds to produce eggs. Beef, pork, lamb, and poultry come from animals that eat plants and feeds that come from plants.

The fuel that warms houses comes indirectly from the soil. Coal formed from plants that grew ages ago. Oil and gas also originated from organic materials, possibly including the remains of animals. All these things grew in the soil at one time or lived on things that grew in the soil.

Fish from the sea, rivers, and lakes live on plants. And these plants live on dissolved minerals that wash into the sea, rivers, and lakes from the soil.

MONT-315

Cows get their nourishment from the soil and, in turn, give us milk, beef, and hides for making leather.

WHY PLANT TREES?

The best time for this activity is spring in the North and fall in the South. It is excellent for an Arbor Day observance.

Plan in advance the kind of trees you are going to plant and where to plant them. Soil and climate will determine, to a great extent, the kind of trees selected. How the trees will be used also has a bearing on the kind selected. Check with local resource specialists for the best time to plant and the kinds of trees best suited to soil, location, and purpose.

In addition to seedlings or transplants, you will need buckets for carrying the seedlings, water, grub hoes or mattocks, spades, and shovels or specially constructed dibbles or planting bars. The size of planting stock will determine planting method and tools.

If the area is covered with grass sod, use the grub hoe to strip the sod from a spot 12 to 18 inches square. If the ground is hard, dig it up and crumble the clods.

Carry the seedling trees in a 12- to 14-quart pail half filled with water or in boxes containing wet moss or burlap to keep roots moist at all times. Take one tree at a time from the container and leave the roots exposed no longer than necessary. Set the tree in a hole that is just deep enough to allow the roots to hang down freely. Do not put pieces of sod or undecomposed trash in the hole where they will touch the roots. Pack the soil firmly around the roots; do not leave any air pockets. Water thoroughly and, if the ground is dry, frequently until the tree is well established.

Girl Scouts of the U.S.A.

Forests are fascinating study areas for Girl Scouts.

The area around young trees needs cultivation 1 or more years in many sections of the country to eliminate grass and weed competition for moisture. A straw or grass mulch spread 1 to 2 feet around the tree, in areas of high rainfall, eliminates or reduces the need for cultivation. For information on the best way to plant and care for trees in your area, see your county agent, extension forester, or SCS woodland conservationist.

INTERPRETATION

Trees, like other plants, must be suited to the soils and climate of the area in which they are planted. Many kinds of trees such as pines, spruces, and firs can withstand freezing winter temperatures, short summer growing seasons, scant rainfall, and rocky, somewhat acid soils. Others such as maples, magnolias, and oaks require warmer temperatures, longer growing seasons, more moisture, and deep, rich soils. Some kinds of trees are better adapted than others to survive the effects of air pollution in urban and suburban locations or heavy use in picnic and recreation areas.

Trees serve a variety of purposes. A dense canopy of leaves protects the soil from the impact of falling rain, thus reducing soil erosion and helping prevent stream pollution caused by sediment. Trees are used to revegetate and stabilize strip-mined lands. They serve as screens around undesirable sights such as city dumps, auto graveyards, sanitary landfills, and parking lots. They shade urban and rural homes from the hot summer sun and protect them from severe winter winds. They serve as buffers against noise pollution caused by automobiles and airplanes.

Trees can be grown as a crop on millions of acres of land not suited to other kinds of crops. Wooded areas ranging in size from small woodlots to vast forests are owned by industries, by county, state, and federal governments, by farmers, ranchers, businessmen, housewives, and others. These trees supply the lumber for construction, plywood, furniture, and the raw materials used in the manufacturing of such products as turpentine, plastics, swim suits, and other clothing, and the fine abrasives used in polishing space vehicle components.

Forests provide recreation opportunities for millions of people as well as food and shelter for a variety of wildlife, such as deer, bears, elk, beavers, squirrels, and birds.

Good management of forests helps protect our sources of water, for the headwaters of most major streams lie in forested areas. The kind of management needed to care for forests and to protect them from such things as an overabundance of wildlife, from insects and diseases, and from overuse and misuse by people, depends on many factors—including the tree species, their condition as well as the condition of the total forest, and the intended use of the trees. If properly done, harvesting the mature trees does not damage forests. They can regenerate themselves over a period of time through natural processes; man often helps shorten the time of regrowth by preparing the soil and seeding the area, and by planting seedlings.

After trees are cut, branches are often left in the woods; slabs, edgings, and bark are sometimes burned at the mill. This waste material can be converted into small wood chips for mulching.

Products made from wood are often wasted. The most obvious example is in the wastebaskets we empty daily and the newspapers that are discarded. Wood fiber from paper can be reclaimed. About 20 percent of the wastepaper is now being recycled. As recycling processes improve and recycling plants increase in number, the waste will be reduced. Recycling also will help to reduce the demand for new wood fiber, a demand that foresters believe may surpass timber growth in this country by 1980.

MICH-61,118

The fruit of mountain ash, even after a heavy snowfall, attracts wildlife.

HOW DO YOU MAKE A DEMONSTRATION AREA?

Make a demonstration area some place on your campsite. Perhaps your group has a meeting room where a permanent conservation corner can be established. You can collect and exhibit many things that relate to soil, water, grassland, woodland, wildlife, and minerals. Here are a few suggestions:

Different kinds of soil. Put them in small glass jars and label them.

Different kinds of rocks from which soil is formed. Label each. (A good way to keep rocks is to embed them in a 1-inch layer of plaster of paris poured into a cardboard box.)

Different kinds of fertilizers. Keep in small glass jars and label.

Seeds of various plants that protect the soil. Label each.

Leaves, bark, twigs, and fruit of trees, shrubs, and vines. (Learn how to collect leaves and to press and mount them for display.)

Make your displays and collections tell a story. Leaves, insects, and rocks can be more interesting if, for example, the leaves are organized into smaller, more significant displays of leaf types, and if rock exhibits show how mountains are formed, what kind of soil is formed from each type of rock, and what stones are used for building materials. Show how leaf burning adds to air pollution, for example, by arranging a small pile of leaves with simulated smoke spirals of blue-painted wires or with a painted background of smoke.

WO-43-34

Scouts learn about aquatic life, soil erosion, and water pollution from a demonstration area along a stream.

An exhibit also can show the formation or erosion of the soil on a campsite or the interrelationships of soil, water, plants, animals, and people in a watershed, park, garden, and the like.

Short and informal labels on an object or exhibit can capture interest, arouse curiosity, and stimulate thought. Make new labels occasionally to point out new facts.

An area labeled "What is it?" could be set aside and unidentified finds placed there. As a special group event, points could be given for identifying these objects.

Make a conservation scrapbook by collecting pictures from newspapers, magazines, and other sources showing erosion and how it can be controlled. Relate soil and water conservation to plants, birds, and animals.

Organize the pictures to tell a story. For example, group them so they show the kinds of erosion and the control measures used—terraces, contouring, grass, trees, farm ponds, and others. Collect pictures of birds and other wildlife that came to a campsite or farm after erosion control measures were applied.

Cut pictures and articles on conservation from newspapers and magazines and put them on the bulletin board. A special section might have reports on observations of birds, first spring flowers, and the like, or on a local conservation issue.

Fresh-water and salt-water aquariums show a variety of aquatic plantlife and animal life. Even more intriguing for display and study is a terrarium. A terrarium may show many different habitats—woodland, bog, prairie, and desert—or it may contain small living plants of any area.

At least 14 of the 21 activities described in this booklet can be done indoors or set up outdoors as demonstrations. Jars, pots, cans, and bottles can be used repeatedly, and the various kinds of soil collected can be air dried and stored in containers for indoor use during the winter.

INTERPRETATION

Collecting materials and setting up exhibits or demonstration areas can be an absorbing part of a conservation project.

OH-1,304-10

Collecting butterflies for an exhibit is fun as well as a learning experience.

In exploring the environment, you can see how soil, water, plants, and animals make up the living community.

You also can work with other troop members in preparing demonstrations and exhibits for special occasions, such as council events and school assemblies, and for store window displays. Participating in presentations for other groups helps develop confidence and skill in appearing before the public. Soil formation, wind and water erosion, and soil and water conservation practices and their application to the land are good subjects.

HOW DO YOU MAKE A CONSERVATION MODEL?

All the girls in your troop can participate in planning and constructing a model of a land area that shows conservation problems and practices; e.g. scout camp, watershed, suburban community, environmental learning area, park, farm, ranch.

PLANNING. Each scout can be responsible for gathering information about a specific conservation principle and for planning ways to illustrate it on the model. Then your group can decide the method of construction to use, the kind and amount of materials needed, the soil and water conservation practices to show, and how to model features such as waterways, ponds, trails, bridges, buildings, and fences.

Local state and federal conservation agencies and organizations, as well as school and city libraries, can provide reference material and visual aids. Most important, however, is firsthand knowledge of the area you plan to model. You need information about land and water use, about the purpose and applicability of conservation practices, and about soil, water, and plant resources. You might build a model of an area as it now appears and make a second model of the same area showing the application of appropriate soil and water conservation practices.

To make a good model you need a map of the area. Local Soil Conservation Service employees can show you sample maps of campsites, watersheds, and other areas in your community and suggest ways to reproduce the contours to scale on your model; for example, you may need to exaggerate the steepness two or three times to emphasize the topography.

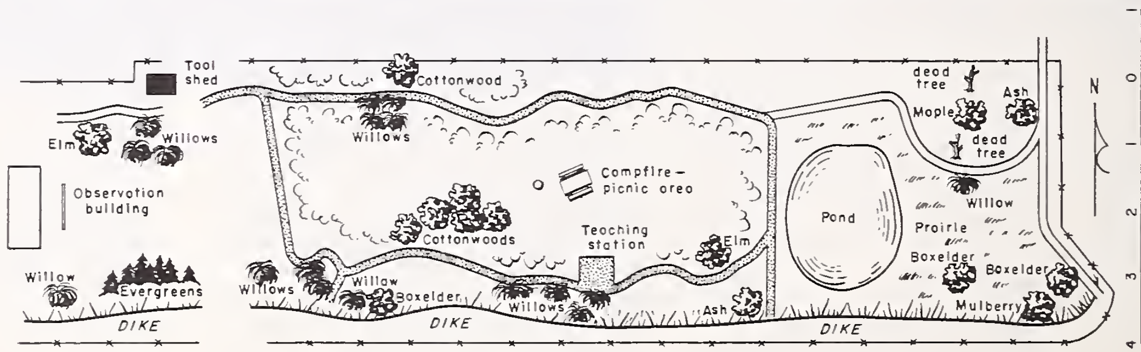
CONSTRUCTION. Models are usually built of fiber insulation board, papier maché, foam plastic, or a salt-flour mixture on a sturdy base. The base can be cut from 1-inch lumber and should be scaled to the size and shape of the area your model depicts. To show topography, use pieces of thick fiberboard cut to match the outlines of the different contours of the land. The pieces are stacked in the order of succeeding elevations and glued together.

File the edges of the layers to make the slopes smooth and even. Plastic crack filler or papier maché may be useful during the final shaping. You can make some minor cuts and fills for roads and waterways.

In decorating the model, first paint it with glue. While the glue is still tacky, sprinkle screened sand over it. This surface has a texture that looks like grass or bare soil when painted suitable colors.

In deciding on the scale for other items

Before constructing a model, make a sketch of land features such as buildings, trails, vegetation, and conservation practices.



on the model, start with the buildings. They need not be the same scale as land forms; usually they can be somewhat larger. But items such as tents, fences, shrubbery, trees, and animals should be in scale with the buildings.

Buildings—Cut buildings from balsa, other softwood, or foam plastic. You can do some carving; paint in windows and doors.

Fences—Drive dark nails or pins for fence posts and cut them off at a suitable height. For woven wire, cut strips of screen and push them into the modeling material; fasten with airplane glue.

Grass and other ground cover—Paint these areas and sprinkle sawdust of an appropriate color over them. Sawdust from different kinds of machines such as sanders, saws, chippers, and jointers has different textures, which can be altered by screening. Fine sawdust is best for grass. Mix the sawdust with a solution of about one-fourth paint and three-fourths turpentine.

Bare soil—Use fine sawdust or the modeling material itself and paint it the desired color.

Terraces—Glue loosely twisted heavy cord or small rope to the model. Shape the areas above and below the cord or rope with crack filler to give the form desired.

Shrubs and trees—Cut sections from colored sponge and glue them in place. To represent a woodlot, treat the whole area as a mass using colored sponge.

For models made of papier maché, start with a sturdy base. Bend and shape chicken wire to the outline of the area you want. Then cover it with layers of paper dipped in paste until you have the right amount for strength and form. Add the buildings and other features.

Models also can be made out of yarn, cardboard, and white glue.

INTERPRETATION

Building a model that shows local land use problems and conservation needs or possible solutions to such problems helps to relate conservation to your home and community. Through this activity you can improve your understanding of the relationships among resources and of the principles of prudent use and care of soil and water and, at the same time, inform others in the community of the need for good resource use and management.

Care of the land is a continuing and long-term effort. An abiding concern for the future should underlie the work of every land user as he manages natural resources. To translate this concern into action to solve problems, a conservation plan based on soil capabilities should be developed with the aid of resource specialists. Farmers and ranchers have had such plans for years. Today conservation plans also are prepared for school grounds, industrial sites, landfills, scout camps, recreational areas, shopping centers, towns, country clubs, golf courses, and for other land uses.

In making a plan, first you must inventory the soil and water conditions and problems of the land. The inventory helps in deciding the best use of land although the objectives of the land user are the final guide. A conservation plan for a golf course is different from a plan for a farm or for a scout camp because uses are different and no two areas are exactly alike. Differences in topography (such as slope), in soil (such as depth, fertility, texture, amount of erosion, wetness), and in other land features must be considered. After the inventory is made and the objectives are decided, a conservation plan of operations is drawn up outlining the soil and water conservation practices needed.

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An aerial photograph helps in constructing a model of the conservation practices and resource problems of an area.

On camp grounds, for example, the plan might call for:

- Locating tent sites only in certain places and rotating them yearly so that no one site is overused.
- Laying out a hiking trail on the contour to control erosion.
- Constructing a firebreak.
- Building a pond.
- Thinning certain wooded areas.
- Improving wildlife habitat.

Making a model of a conservation plan is an excellent way for scouts to learn about conservation problems and how they can be solved.

CONSERVATION TERMS

COMPOST—Decomposed leaves, grass, and other organic materials that are used as a soil conditioner and as a mulch to protect the soil against erosion.

CONSERVATION PRACTICES—Application of skills and knowledge to protect and improve soil, water, and other natural resources. Examples of such application are the following: **diversions** are drainage ways built on the contour to move excess water safely off sloping land; **grassed waterways** are broad, shallow channels planted with grasses that carry excess water from sloping land; **mulches** are plant residues or other materials such as wood chips, straw, or sawdust placed on the soil to help reduce runoff and erosion, conserve soil moisture, and control weeds; **terraces** are embankments or ridges built across a slope that slow runoff and allow water to soak into the soil.

CONTOUR—An imaginary line on the surface of the earth connecting points of the same elevation. Contour lines on a map show topographical features of the land such as steepness of slopes.

FLOOD PLAIN—Nearly level land on either side of a stream that is subject to periodic flooding.

SANITARY LANDFILL—Site for disposing of solid wastes, where refuse is compacted and covered each day with a layer of soil. When filled, it can be used for parks, golf courses, agriculture, and other purposes.

SEDIMENT—Soil particles that are being moved or were moved by water. Greatest single pollutant of water by volume.

SLOPE—Upward or downward slant of the land as it relates to the horizontal. Usually measured in percentage of slope, which equals the number of feet of rise or fall in 100 horizontal feet.

SOIL—Weathered portion of the earth's surface, composed of mineral and organic materials, in which plants grow.

SOIL CONSERVATION—Protection and improvement of soil by using it within its capabilities and applying conservation practices as needed.

SOIL SUITABILITY—The ability of the soil to support various land uses such as farming, ranching, forestry, and construction of roads, parks, and buildings.

WATERSHED—Total land area above a given point on a stream that contributes water to the flow at that point.

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